# METHOD AND APPARATUS REDUCING OFF-TRACK HEAD MOTION DUE TO DISK VIBRATION IN A HARD DISK DRIVE THROUGH THE HEAD GIMBAL ASSEMBLY

## ABSTRACT OF THE DISCLOSURE

Improved head gimbal assemblies reducing TMR (Track Mis-Registration) in a hard disk drive are provided. These head gimbal assemblies are as mechanically simple as contemporary head gimbal assemblies, support parallel flying sliders over flat disk surfaces, and reduce TMR induced by disk vibration. They are easier to build, more reliable, and cost less to make, than other known approaches at comparable track densities and rotational rates. The improved head gimbal assemblies include three sets of mechanisms for moving the slider parallel the disk surface, when the disk surface is flat, and radially moving the slider toward the track, when the disk surface is bent. The first and third mechanisms as well as the second and third mechanisms can be used together in a head gimbal assembly.

An improved and distinctive servo-controller scheme resulting in an overall improvement in PES performance, particularly when applied to hard disk drives employing the invention's TMR reduction mechanisms. The servo-controllers trade off gain in the disk vibration frequency range, in favor of, increased rejection of low frequency disturbances. This leads to the lowest PES statistics, when applied to hard disk drives with the TMR reduction mechanisms of the invention.